NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

IRRIGATION WATER MANAGEMENT

(Acre)
CODE 449

DEFINITION

Irrigation water management is the process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner.

PURPOSES

Irrigation water management is applied as part of a conservation management system to support one or more of the following:

- Manage soil moisture to promote desired crop response.
- Optimize use of available water supplies.
- Minimize irrigation induced soil erosion.
- Decrease non-point source pollution of surface and groundwater resources.
- Manage salts in the crop root zone.
- Manage air, soil, or plant micro-climate.
- Chemigation.

CONDITIONS WHERE PRACTICE APPLIES

This practice is applicable to all irrigated lands.

An irrigation system adapted for site conditions (soil, slope, crop grown, climate, water quantity and quality, etc.) must be available and capable of applying water to meet the intended purpose(s).

CRITERIA

General Criteria Applicable To All Purposes

All planned work shall comply with all Federal, State, and local laws and regulations. Water shall not be applied in excess of the needs to meet the needs of the intended purpose. Plans to utilize water resources may need to be approved or permitted by the appropriate Water Management District in accordance with Chapter 40-2 Florida Administrative Code (F.A.C.).

Irrigation water management requires that the irrigator has the knowledge and capability to manage irrigation water resources in such a manner that the plant is able to make optimum use of the water. The irrigator shall apply the following steps in the irrigation of crops:

1. Determine when irrigation water should be applied, based on the available soil moisture holding capacity, soil moisture measurements, and the rate of water used by crops during all stages of plant growth and crop response.
2. Measure or estimate the amount of water required for each irrigation, including leaching needs.
3. Determine the normal time needed for the soil to absorb the required amount of water and how to detect changes in intake rate.
4. Determine stream size or application rate and adjust irrigation time as needed to compensate for changes in such factors as intake rate or the amount of water to be applied.
5. Recognize erosion caused by irrigation.

6. Estimate the amount of irrigation runoff from an area.
7. Evaluate the uniformity of water application.
8. Evaluate climatic data.

The determination that irrigation water management is being practiced shall be determined by evaluating the irrigator's knowledge and use of the principles of irrigation water management as described above. Irrigation water management shall be documented in writing. NRCS form FL-ENG-449 may be used for documenting irrigation water management.

Guidance for determining irrigation water requirements is contained in the Florida Irrigation Guide and National Engineering Handbook (NEH), Part 623, Irrigation, Chapter 2.

Additional Criteria to Manage Soil Moisture to Promote desired Crop Response

The following principles shall be applied for various crop growth stages:

- The volume of water needed for each irrigation shall be based on plant available water holding capacity of the soil for the crop rooting depth, management allowed soil water depletion, irrigation efficiency, and water table contribution.
- The irrigation frequency shall be based on the volume of irrigation water needed and/or available, the rate of crop evapotranspiration, and effective precipitation.
- The application rate shall be based on the volume of water to be applied, the frequency of irrigation applications, soil infiltration and permeability characteristics, and the capacity of the irrigation system.

Additional Criteria To Optimize Use Of Water Supplies

Limited irrigation water supplies shall be managed to meet critical crop growth stages.

On high water table soils, the water table shall be managed at a level that will allow the maximum storage of rainfall and provide the required moisture to the plant.

Additional Criteria to Minimize Irrigation Induced Soil Erosion

Application rates shall be consistent with local field conditions for long term productivity of the soil. On soils that are susceptible to irrigation induced erosion, the irrigation system should be operated so that the application rate is less than the basic soil infiltration rate as given in the Florida Irrigation Guide.

Additional Criteria to Decrease Non-Point Source Pollution of Surface and Groundwater Resources

Water application shall be at rates that minimize transport of sediment, nutrients, and chemicals to surface waters and that minimize transport of nutrients and chemicals to groundwater.

The potential for nutrient losses is high if excess irrigation water is applied. Weather conditions must be considered before nutrients are applied. Nutrients should not be applied when rainfall is imminent.

The amount of nutrients to be applied must be determined according to the production level of the crop, the soil nutrient status, and the plant nutrient status. The scheduling of nutrient application should coincide with the irrigation cycle in a manner that will not leach nutrients below the root zone. The nutrient management plan shall be followed in the timing and rate of nutrient application. Net irrigation application should not exceed the available water holding capacity of the soil within the root zone.

Additional Criteria to Manage Salts in the Crop Root Zone

The irrigation application volume shall be increased by the amount required to maintain an appropriate salt balance in the soil profile.

The requirement shall be based on the leaching procedure contained in the NEH, Part 623, Irrigation, Chapter 2.

Additional Criteria to Manage Air, Soil, or Plant Micro-Climate

The irrigation system shall have the capacity to apply the required rate of water for cold or heat protection as determined by the methodology contained in NEH, Part 623, Irrigation, Chapter 2.

The irrigation system must be capable of uniformly applying the required rate of water application based on the anticipated minimum temperature, maximum wind speed, and relative humidity.

Water application should begin when the temperature is above the critical temperature of the crop being protected. Water application should stop when the wet bulb temperature is above the critical temperature of the crop being protected. Careful consideration should be given to the wind speed as this increases evaporative cooling.

Criteria contained in the Water Management District Rule 40-2 F.A.C. shall be followed in the use of water for cold protection.

Additional Criteria for Chemigation

The scheduling of nutrient and pesticide application should coincide with the irrigation cycle in a manner that will not cause excess leaching of nutrients or pesticides below the root zone to the groundwater or cause excess runoff to surface waters.

Weather conditions must be considered before applying chemicals. Chemigation should not be applied if rainfall is imminent. Application of chemicals will be the minimum length of time to deliver the chemicals and flush the pipelines. Irrigation application amount shall be limited to the amount necessary to apply the chemicals to the soil depth recommended by label. The timing and rate of application shall be based on the pest or nutrient management plan.

CONSIDERATIONS

Irrigation water management may affect the water budget, especially volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation and ground water recharge because of an increased amount of water stored in the root zone for plant use.

Irrigation can influence runoff and ground water percolation by raising the soil moisture level and decreasing the available soil water storage capacity, thus increasing the amount of runoff or percolation below the root zone from storm events. This may affect surface water quality by the movement of sediment, soluble chemicals, and sediment attached substances carried by runoff or ground water quality through the movement of dissolved substances below the root zone.

Irrigation water use may affect downstream flows or aquifers and the amount of water available for other water uses.

Irrigation may affect the salinity of soils, soil water and downstream water resources.

Consider the effects that irrigation water has on wetlands, water related wildlife habitats, riparian areas, cultural resources, and recreation opportunities. Irrigation may affect the temperature of water resources that could cause undesirable effects on aquatic and wildlife communities.

Consideration should be given to managing precipitation effectiveness, crop residues, and reducing system losses.

Modify plant populations, crop and variety selection, and irrigated acres to match available or anticipated water supplies.

Water should be managed in such a manner as to not drift or come in direct contact with surrounding electrical lines, supplies, devices, controls, or components that would cause shorts in the same or the creation of an electrical safety hazard to humans or animals.

Consideration should be given to electrical load control/interruptible power schedules, repair and maintenance downtime, and harvest downtime.

Quality of irrigation water should be considered relative to its potential effect on the soil's physical and chemical properties, such as soil crusting, pH, permeability, salinity, and structure.

Consider the quality of water and the potential impact to crop quality and plant development.

Avoid traffic on wet soils to minimize soil compaction.

Consider improving the irrigation system to increase distribution uniformity of irrigation water application.

Chemigation may be required at the same time the crop receives irrigation, while at other times chemical applications may be required when irrigation water is not needed by the crop. This will affect the economics of chemigation. Chemigation through irrigation systems that are capable of a minimum water application of 0.1

inch or less can greatly reduce the cost of chemigation and may improve the effectiveness of application.

On soils with steep slopes or other factors where irrigation induced erosion is a concern, crop residue management practices which increase the soil infiltration rate should be applied. In addition, equipment modifications and/or soil amendments such as polyacrylamides and mulches should be considered to decrease erosion.

Consider the potential for spray drift and odors when wastewater is used for irrigation. Timing of irrigation should be based on prevailing winds to reduce odor. In areas of high visibility, irrigating at night should be considered.

An irrigation system evaluation should be performed to determine if the irrigation system meets the minimum uniformity as specified in the applicable NRCS conservation practice standard for irrigation. Procedures for evaluating irrigation systems are contained in the Florida Irrigation Guide and the NEH, Part 623, Irrigation. Where the irrigation system does not meet the minimum uniformity, it should be modified to meet or exceed the minimum specified uniformity.

PLANS AND SPECIFICATIONS

An irrigation water management (IWM) plan shall be prepared for the irrigator in keeping with the principles of this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s). The IWM plan shall include job sheets or similar documents that specify the applicable requirements for applying the practice. IWM plans shall include the following as applicable:

- Timing of irrigation.
- Method for measuring soil moisture.
- Method for adjusting irrigation to compensate for changes in the soil infiltration rate.
- Method for evaluating irrigation system uniformity.
- Method for measuring irrigation system application rate.
- Method for evaluating soil erosion.
- Method for adjusting the irrigation schedule(s) for chemical application.
- Method for recognizing excess runoff.

OPERATION AND MAINTENANCE

There are no operation and maintenance (O&M) aspects applicable to this standard. Necessary O&M items are addressed in the physical component standards considered companions to this standard.

REFERENCES

Florida Irrigation Guide
NEH Part 623, Irrigation, Chapter 2
NRCS form FL-ENG-449
Water Management District, Chapter 40-2 F.A.C.